Supporting Information

Rapid and ratiometric sensor for CAN (Ce^{4+}) through metal assisted oxidation reaction-altered Through Bond Energy Transfer (TBET): development of low cost devices (TLC plate sticks)

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CONTENTS

1. Determination of fluorescence quantum yield:

Here, the quantum yield φ was measured by using the following equation,

$\varphi_x = \varphi_s (F_x / F_s)(A_s / A_x)(n_x^2/ n_s^2)$

Where,

X & S indicate the unknown and standard solution respectively, φ = quantum yield,

F = area under the emission curve, A = absorbance at the excitation wave length,

n = index of refraction of the solvent. Here φ measurements were performed using quinine sulfate in ethanol as standard [φ = 0.546] (error ~ 10%).

The quantum yield of **RCH** itself is 0.004 which is remarkably changed into 0.26, an enhancement around 65 fold is observed.

2. Calculation of the detection limit:

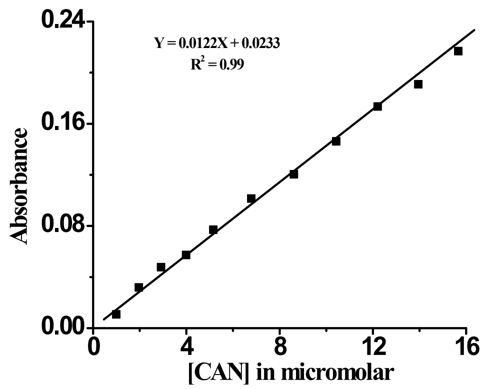


Figure S1: Absorbance change of RCH upon gradual addition of CAN.

The detection limit DL of **RCH** for CAN was determined from the following equation[1]:

DL = K* Sb1/S

Where K = 2 or 3 (we take 2 in this case); Sb1 is the standard deviation of the blank solution; S is the slope of the calibration curve.

From the graph we get slope = 0.0242, and Sb1 value is 0.008292.

Thus using the formula we get the Detection Limit = 0.685 μM i.e. RCH can detect CAN in this minimum concentration.

3. Calculation of rate constant:

From the time vs. Fl. Intensity vs. time (sec.) plot at fixed wavelength (413nm) using first order rate equation (Figure S5), we get rate constant K = slope X 2.303 = 0.0495 X 2.303 = $11.39 \times 10^{-2}\ s^{-1}$,

4. pH effect on RCH moiety:

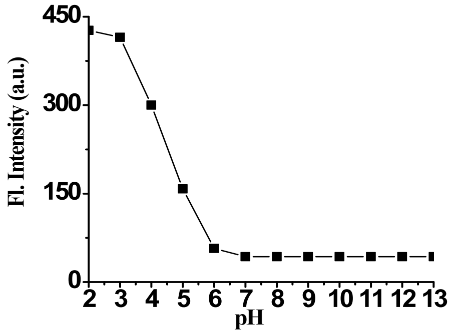
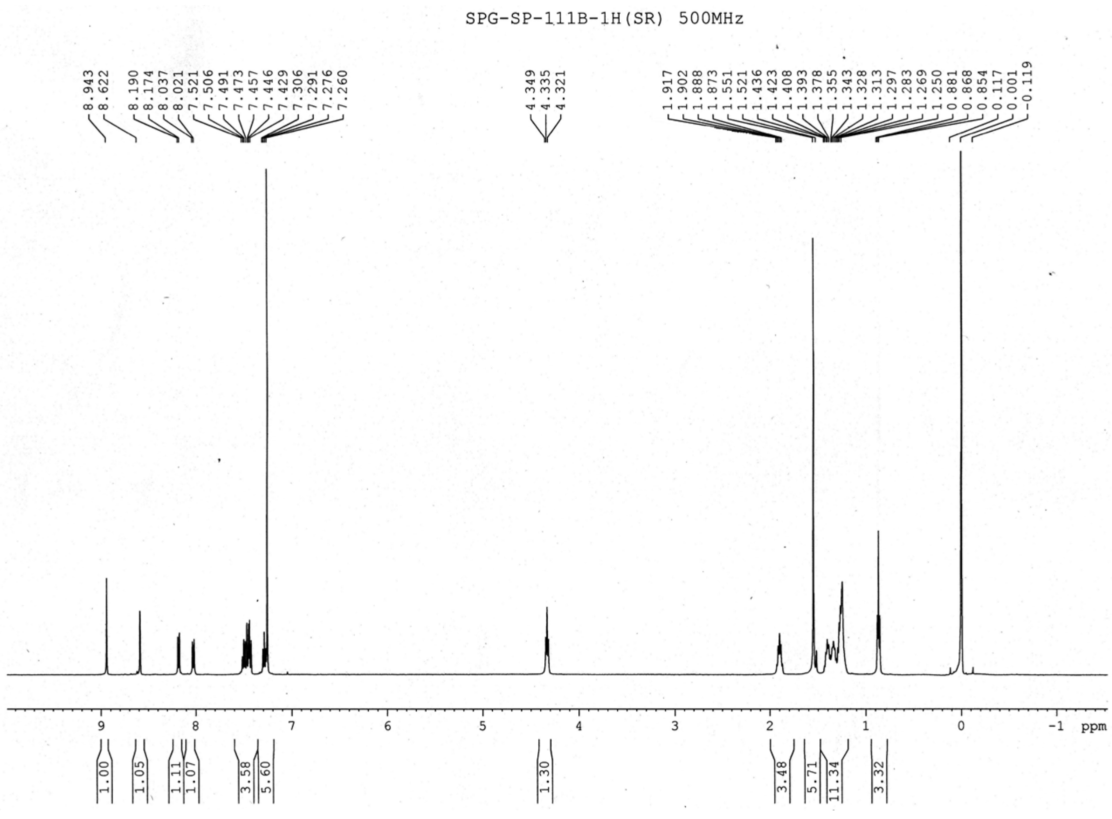


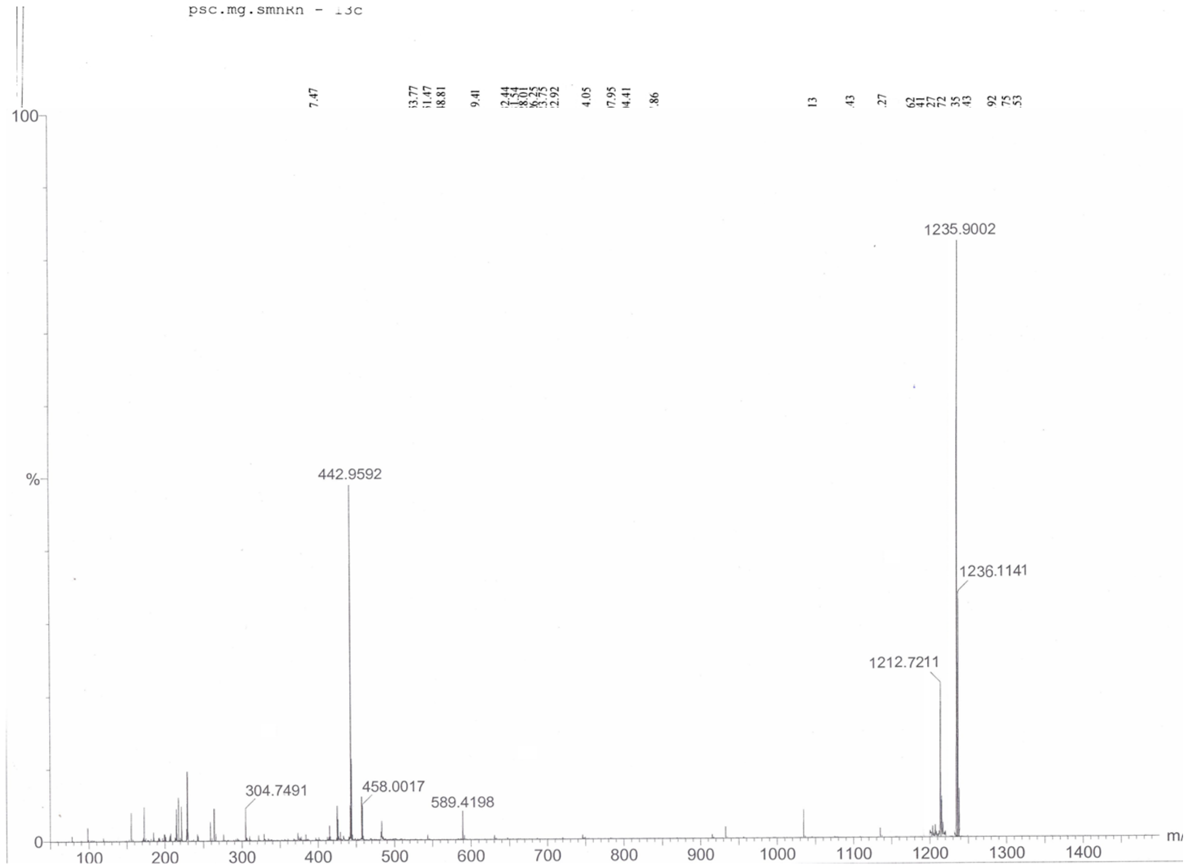
Figure S5: The change of fluorescence intensity of the receptor i.e. RCH (c = $2x10^{-5}$ M) (at 585 nm) with pH.

5. NMR and HRMS spectra of RCH and the corresponding CAN adduct:

^{1}H NMR spectrum of Receptor i.e. RCH:

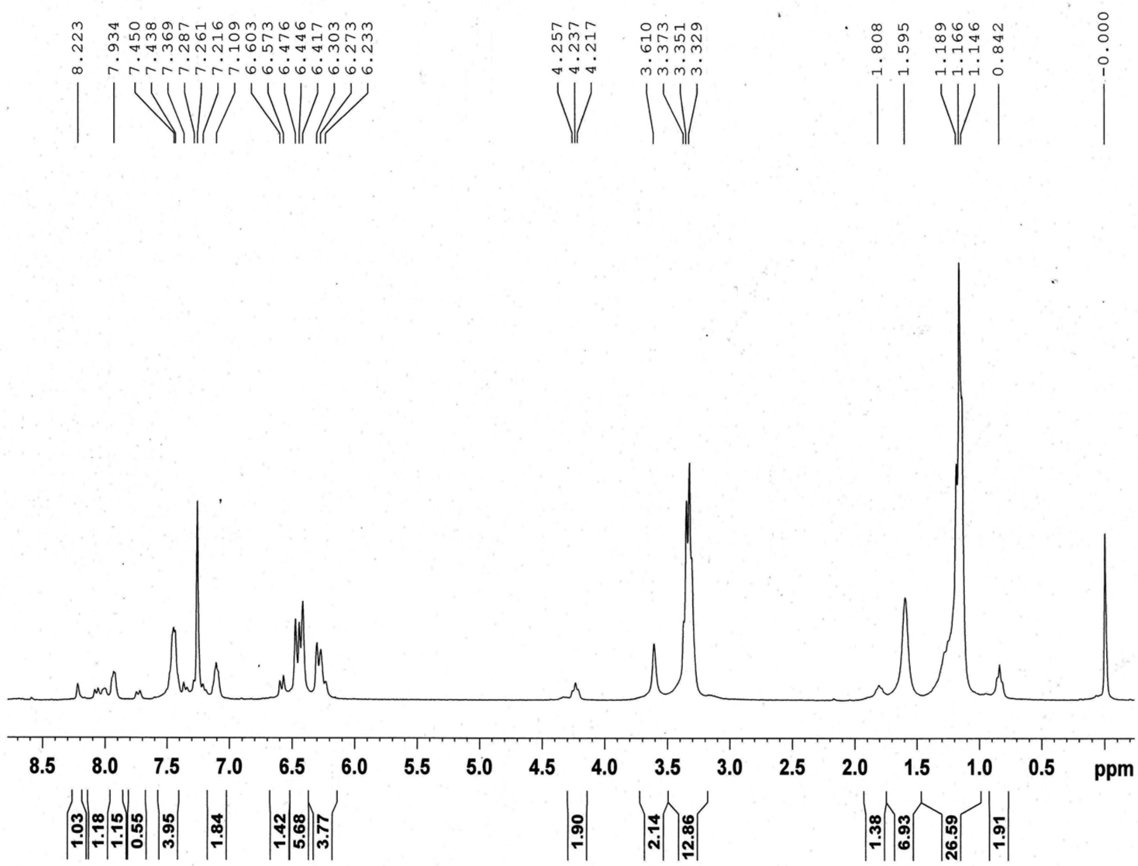


^{13}C NMR spectrum of RCH:

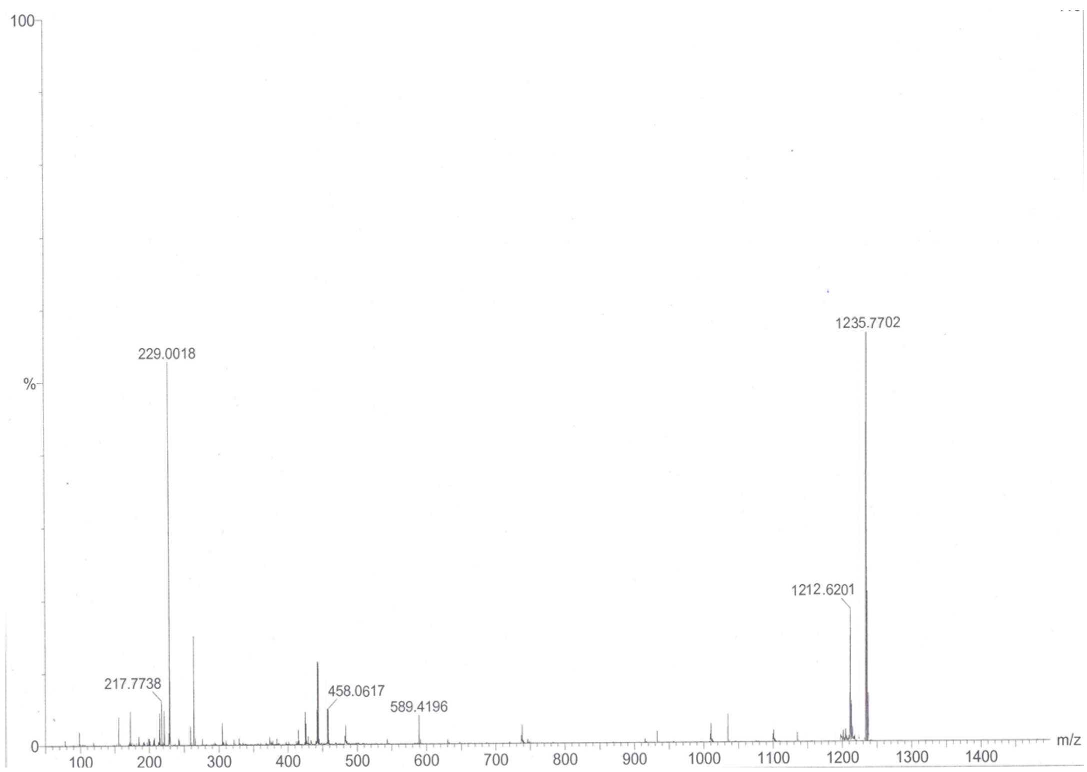


HR MS Mass Spectra of RCH:

^{1}H NMR spectrum of CAN adduct:

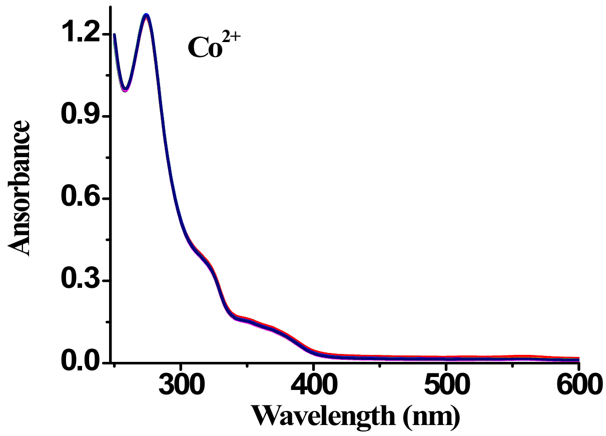


HR MS Spectra of CAN adduct :



6. UV-vis absorption spectra of RCH with different oxidizing agents Co^{2+}, Hg^{2+}, Fe^{3+}, I^-, IBX, NO_3^-, NO_2^-, O_2^-, OH·, OCl^-, PO_4^{3-}, SO_4^{2-}, SO_3^{2-}, CH_3CO_3H. The solutions of anions and oxidants were prepared from $FeCl_3$, $Co(ClO_4)_2·6H_2O$, $HgCl_2$, KI, $NaNO_2$, $NaNO_3$, Na_3PO_4, Na_2SO_3, Na_2SO_4 in CH_3CN-H_2O)

(a)



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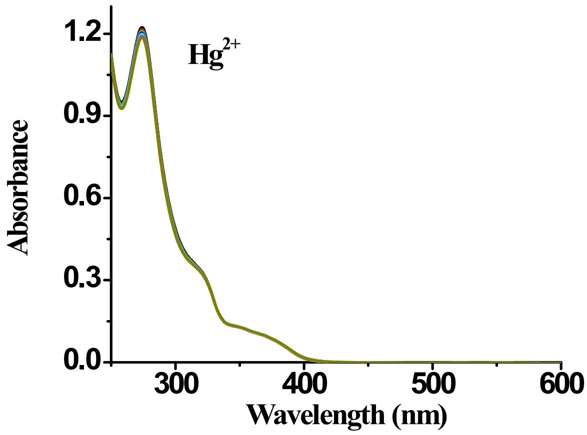

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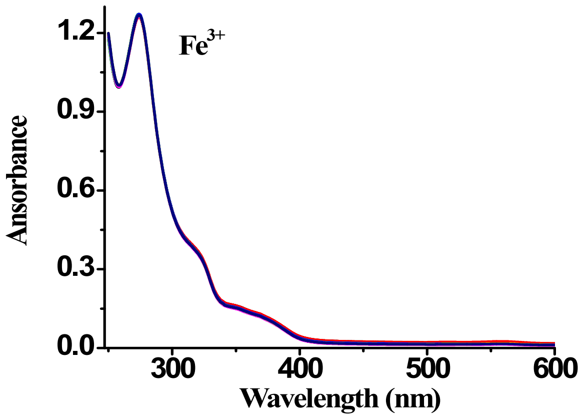

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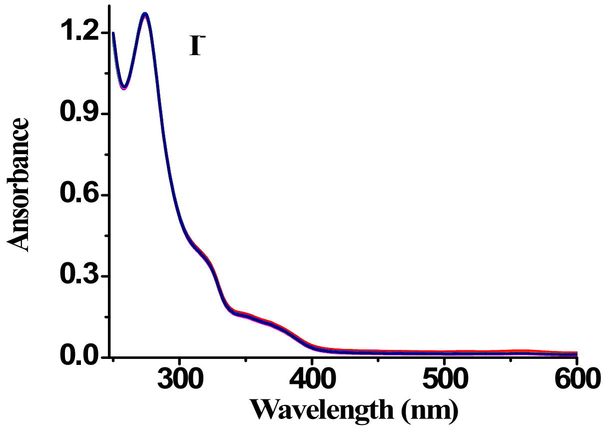

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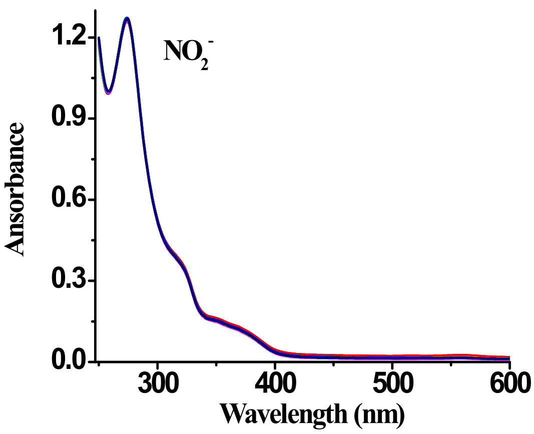

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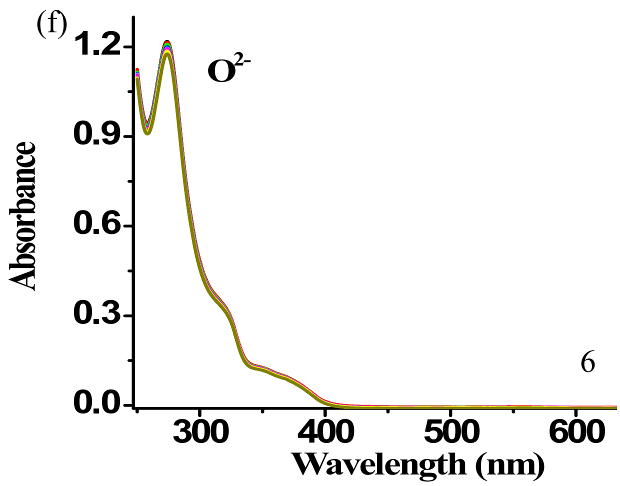

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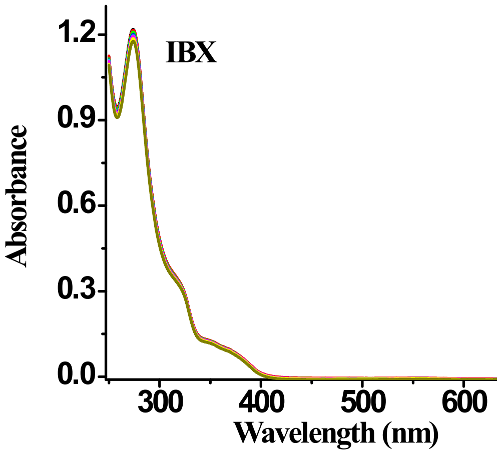
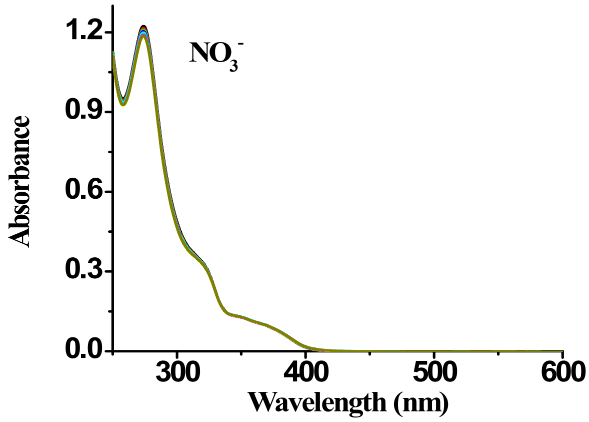
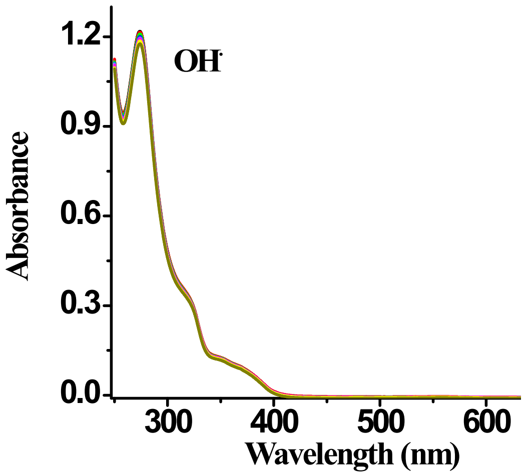

IBX
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

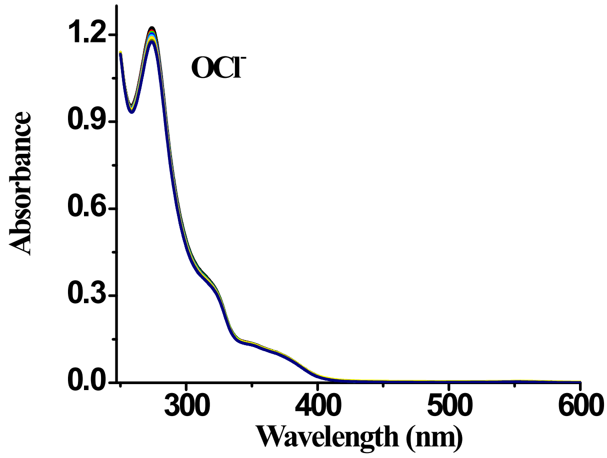
(h)


NO_3^-
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

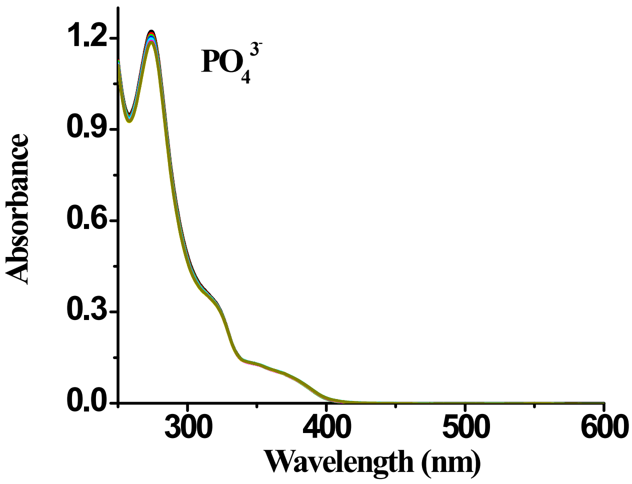
(j)


OH^-
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

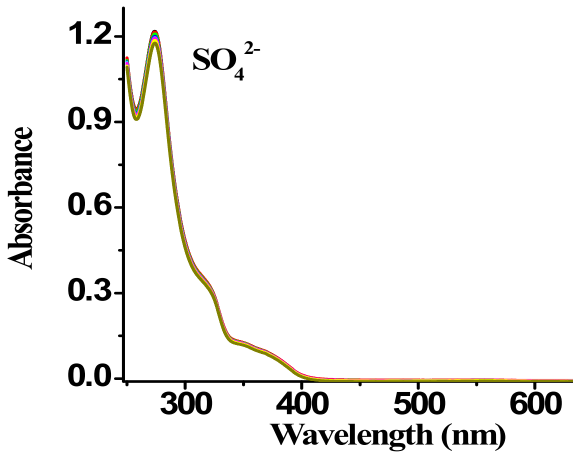
(i)


OCl^-
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

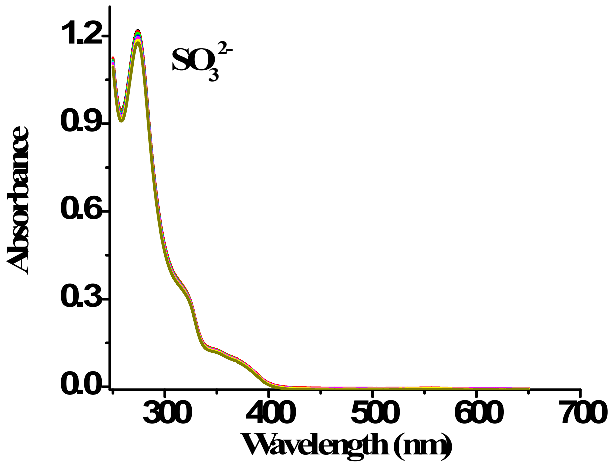
(k)


PO_4^{3-}
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

(l)


SO_4^{2-}
Absorbance
Wavelength (nm)
1.2
0.9
0.6
0.3
0.0
300
400
500
600

(m)



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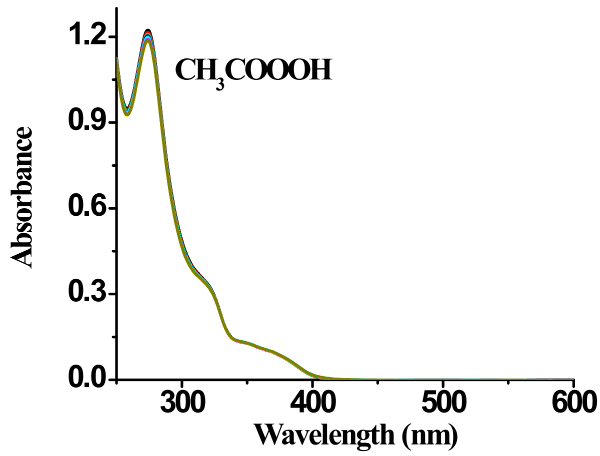
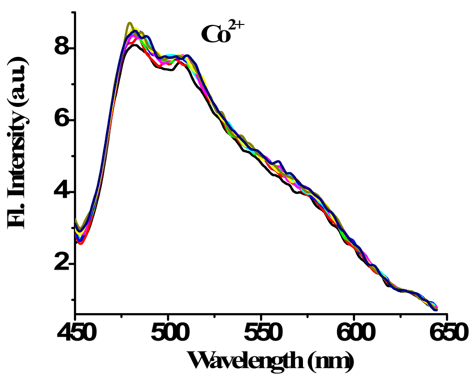


7. Fluorescence emission spectra of RCH with different oxidizing agents Co^{2+}, Hg^{2+}, Fe^{3+}, I^-, IBX, NO_3^-, NO_2^-, O_2^-, $OH^\cdot$, OCl^-, PO_4^{3-}, SO_4^{2-}, SO_3^{2-}, CH_3CO_3H. The solutions of anions and oxidants were prepared from $FeCl_3$, $Co(ClO_4)_2 \cdot 6H_2O$, $HgCl_2$, KI, $NaNO_2$, $NaNO_3$, Na_3PO_4, Na_2SO_3, Na_2SO_4 in CH_3CN-H_2O)

(a)



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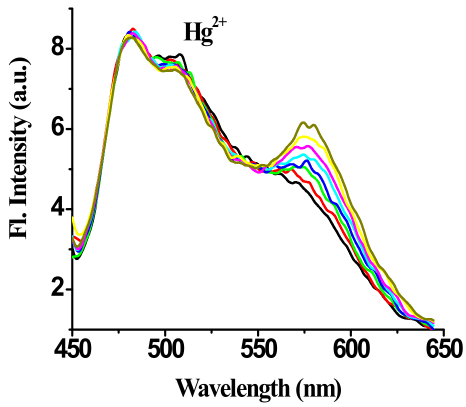

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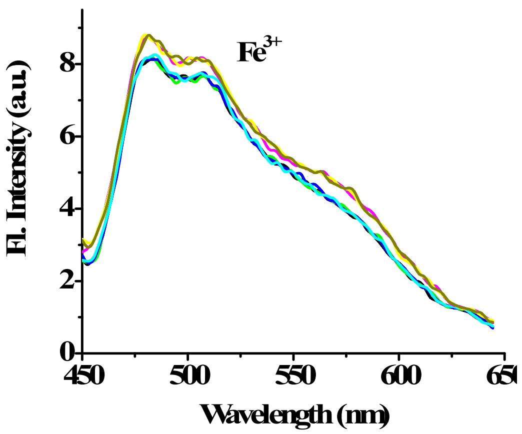
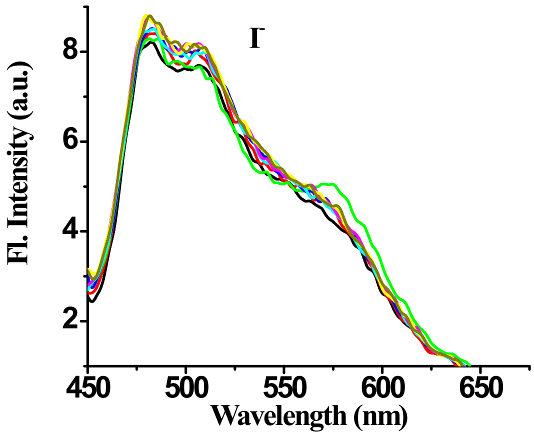


(d)



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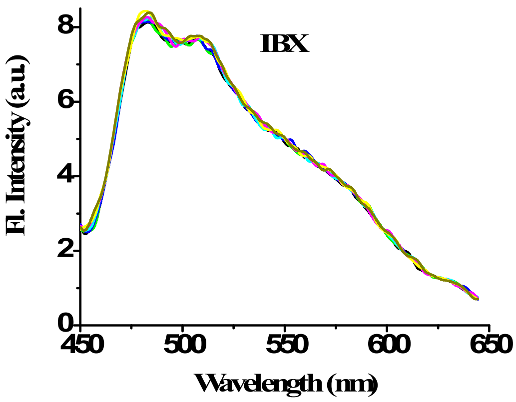
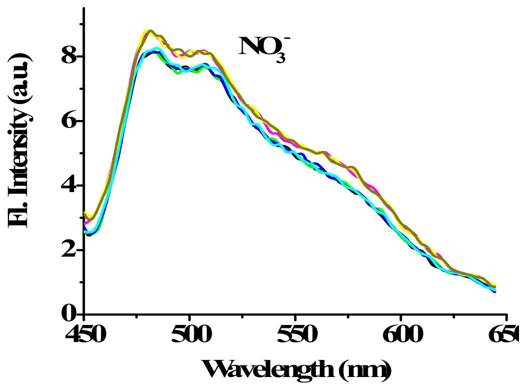
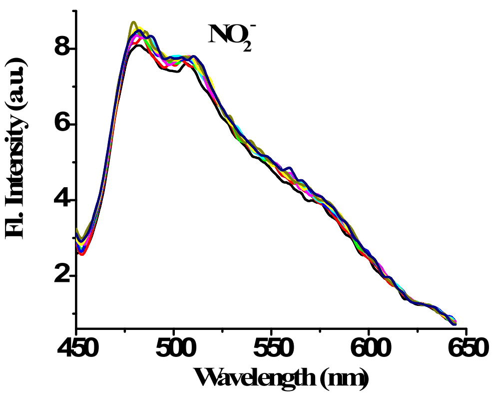

IBX
Fl. Intensity (a.u.)
Wavelength (nm)
0
2
4
6
8
450
500
550
600
650

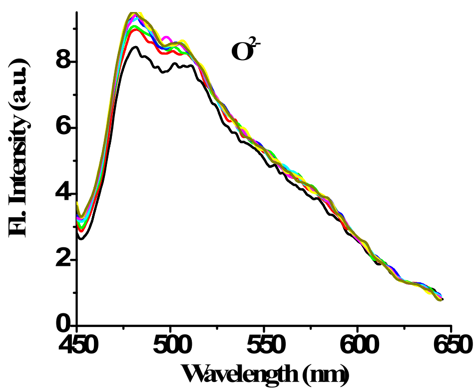
(f)


NO_3^-
Fl. Intensity (a.u.)
Wavelength (nm)
0
2
4
6
8
450
500
550
600

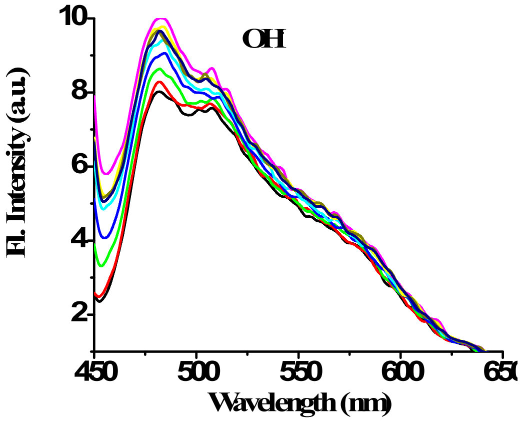
(g)


NO_2^-
Fl. Intensity (a.u.)
Wavelength (nm)
2
4
6
8
450
500
550
600
650

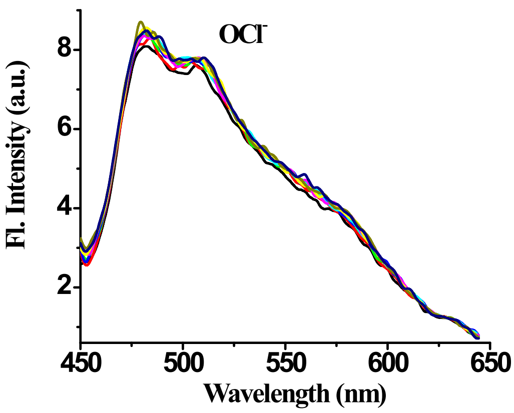
(h)


O^{2-}
Fl. Intensity (a.u.)
Wavelength (nm)
0
2
4
6
8
450
500
550
600
650

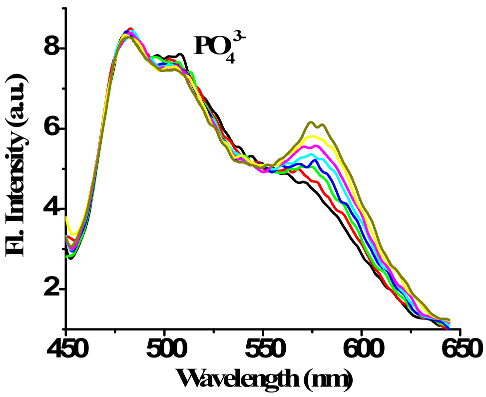
(i)


OH
Fl. Intensity (a.u.)
Wavelength (nm)
2
4
6
8
10
450
500
550
600

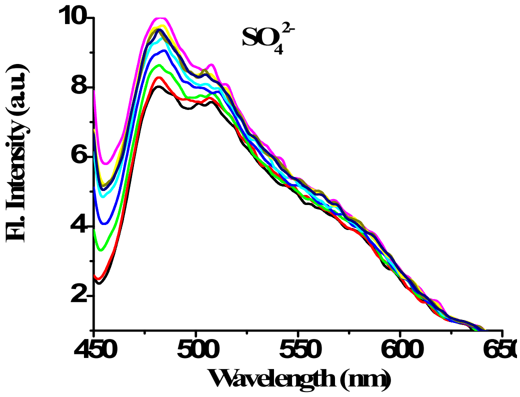
(j)


OCl^-
Fl. Intensity (a.u.)
Wavelength (nm)
2
4
6
8
450
500
550
600
650

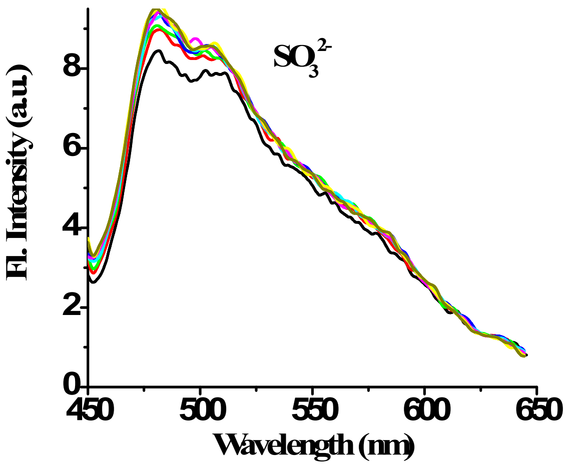
(k)



(l)



(m)



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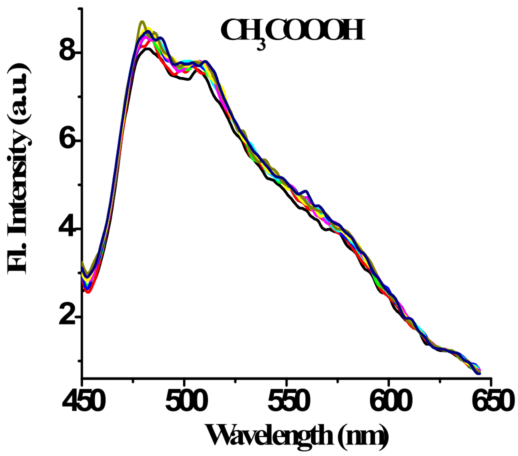

8. References :

1. M. Zhu, M. Yuan, X. Liu, J. Xu, J. Lv, C. Huang, H. Liu, Y. Li, S. Wang, D. Zhu, *Org. Lett.* 2008**, 10***,* 1481-1484